

Social Network Analysis

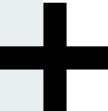
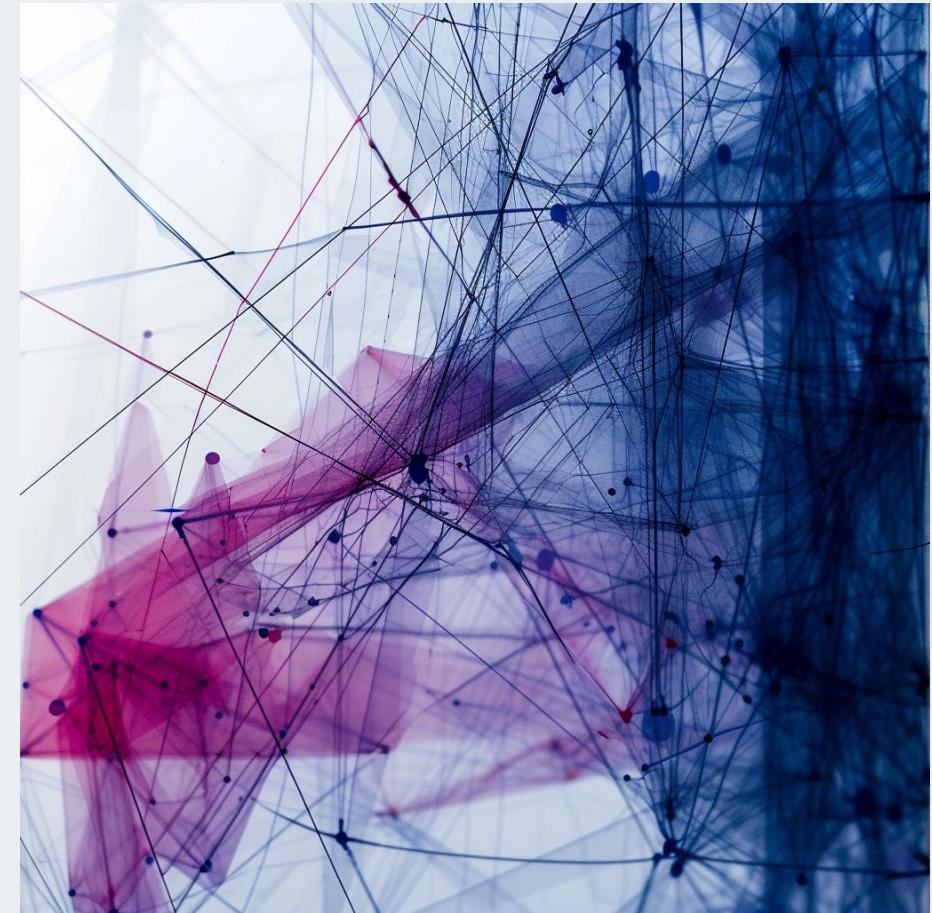
Course Intro.

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Department of Geography,
National Taiwan Normal University

Outline

- Lecturer introduction
- What is the social network?
- Why do you need to take this course?
- What will you learn from this course?
- Syllabus
- Grading policy



Lecturer intro.

Present Position

- Assistant Professor | Department of Geography, National Taiwan Normal University

Education

- Ph.D. | Department of Geography, National Taiwan University
- M.S. | Department of Geography, National Taiwan University
- M.S. | Department of Food Science, Nutrition, and Nutraceutical Biotechnology, Shih Chien University
- B.S.S. | Department of Social and Regional Development, National Taipei University of Education

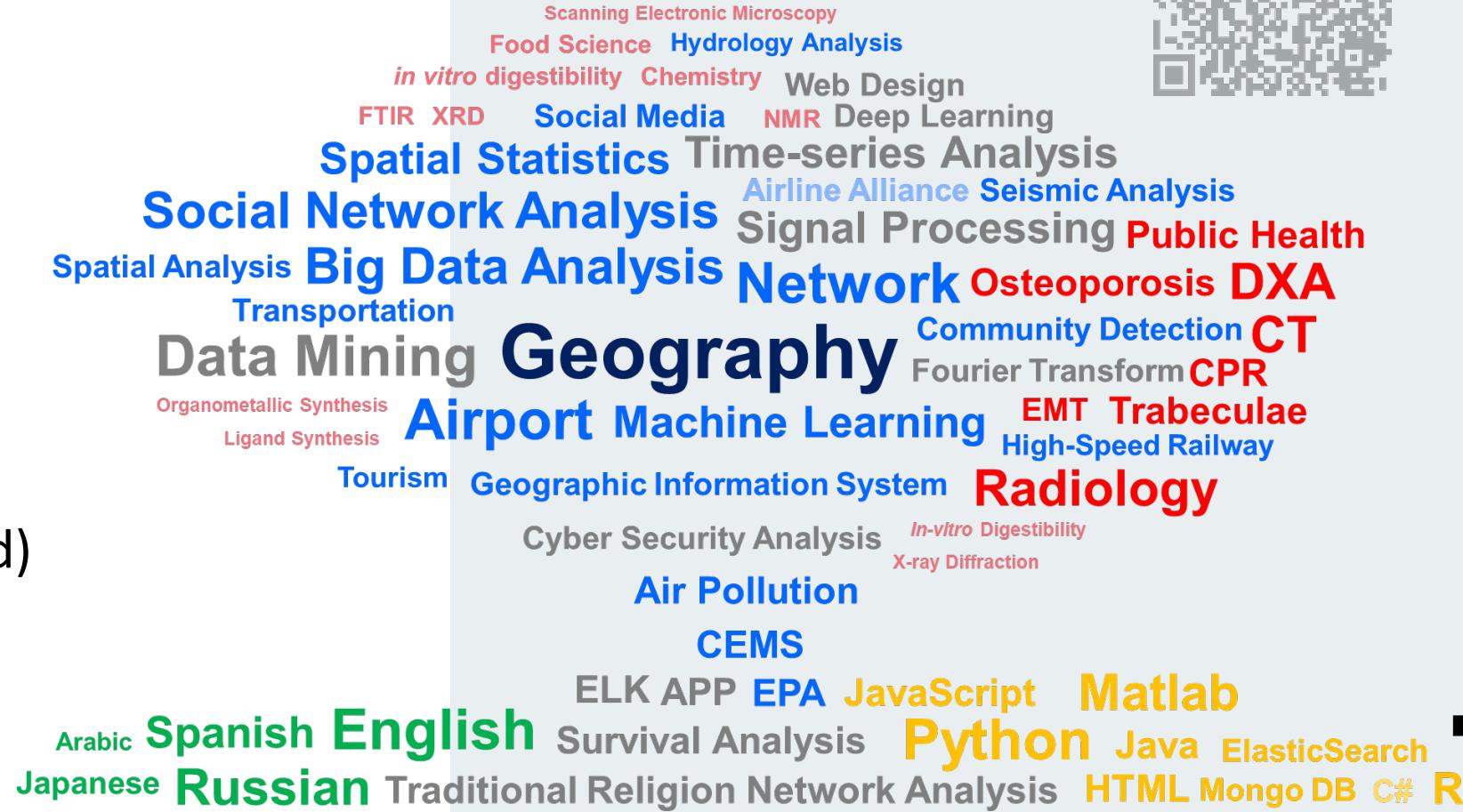
Working Experience

- Assistant Professor | Undergraduate/ Master Program in Intelligent Computing and Big Data, Chung Yuan Christian University
- AI Consultant | Taiwan Cybersecurity Foundry Company
- Adjunct Data Scientist | Institute of Sociology, Academia Sinica
- Adjunct Assistant Professor | Department of Artificial Intelligence, Tamkang University
- Postdoctoral Research Fellow | Department of Radiology, School of Medicine, Taipei Medical University
- Postdoctoral Research Fellow | Department of Radiology, Taipei Municipal Wan Fang Hospital, Taipei Medical University
- Data Scientist Engineer | Cybersecurity Technology Institute, Institute for Information Industry
- Intern Research Assistant | National Science and Technology Center for Disaster Reduction



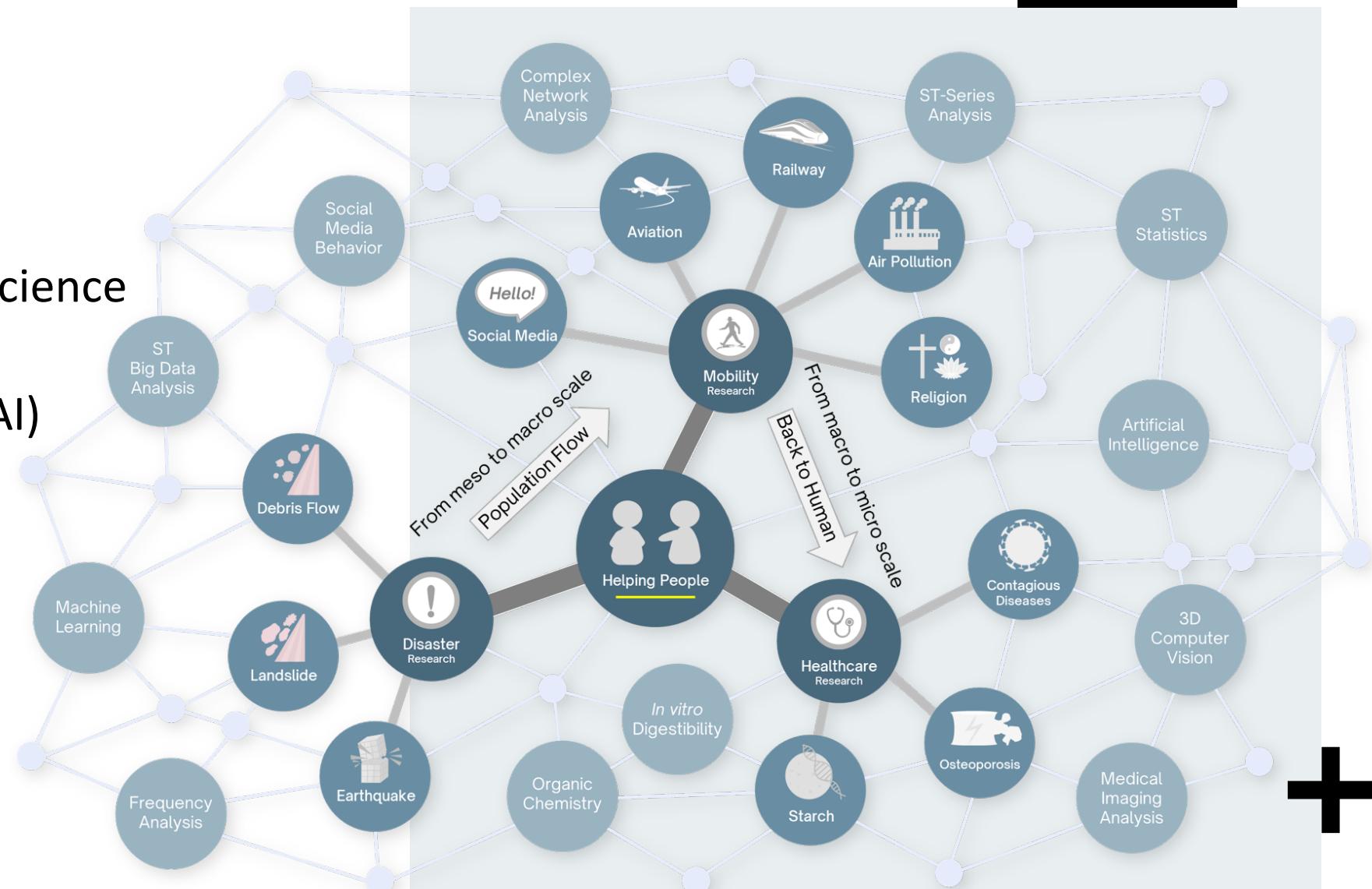
Skill tree

- Geography (GIS)
- Computer Science
- Radiology (bone & EM)
- Public Health
- Traditional Medicine
- Chemistry (basic & food)
- Cybersecurity
- Language (Russian)
- ...

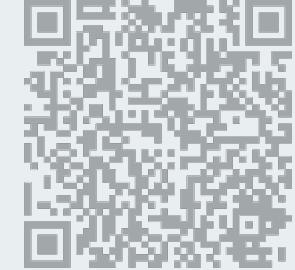


Research interests

- Spatiotemporal Data Science
- Artificial Intelligence
(GeoAI & Explainable AI)
- Machine Learning
- Disaster Prevention
- Clinical Medicine
(Ortho & EMS)
- Food Chemistry
- Cybersecurity



Research community



- My collaborators come from 29 academic institutions and companies across 6 countries.



What is the social networks?

- Complex networks are related to social networks.
- A social network is a set of relations [edge] between subjects [node] (e.g., countries or people), and the relations could be anything (actual existence or abstract concept), such as trading volume and social media friendship.



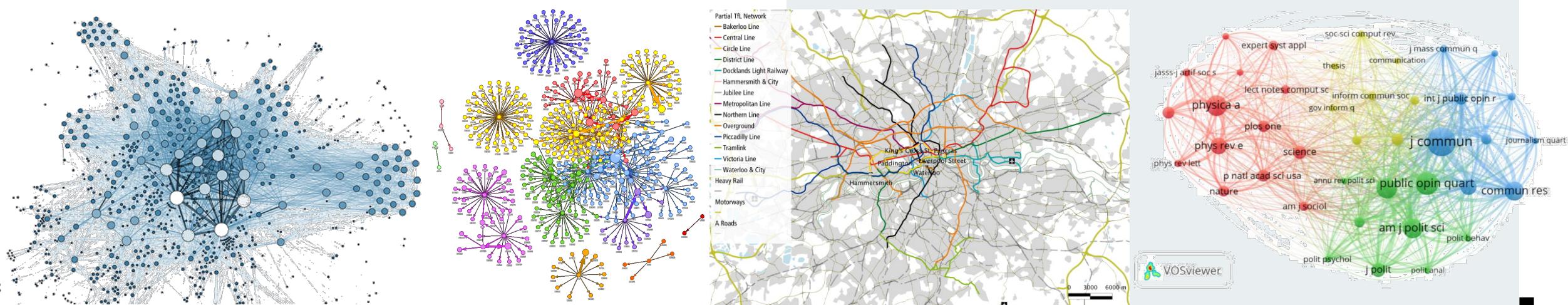
What is the social networks?

- We may leverage various **quantitative** parameters to **characterize** the network structure (node and edge).
- Social network analysis has been adopted in various non-sociological research, and the network structure has become much larger and more complicated; therefore, we call these types of complex networks.



What is the social networks?

- Social networks have been utilized in a wide range of studies, including biological networks [1], religious networks [2], transportation networks [3], and citation networks [4].



[1] <https://serious-science.org/controlling-noisy-dynamics-in-biological-networks-to-fight-cancer-5376> (access on Jan. 21, 2023)

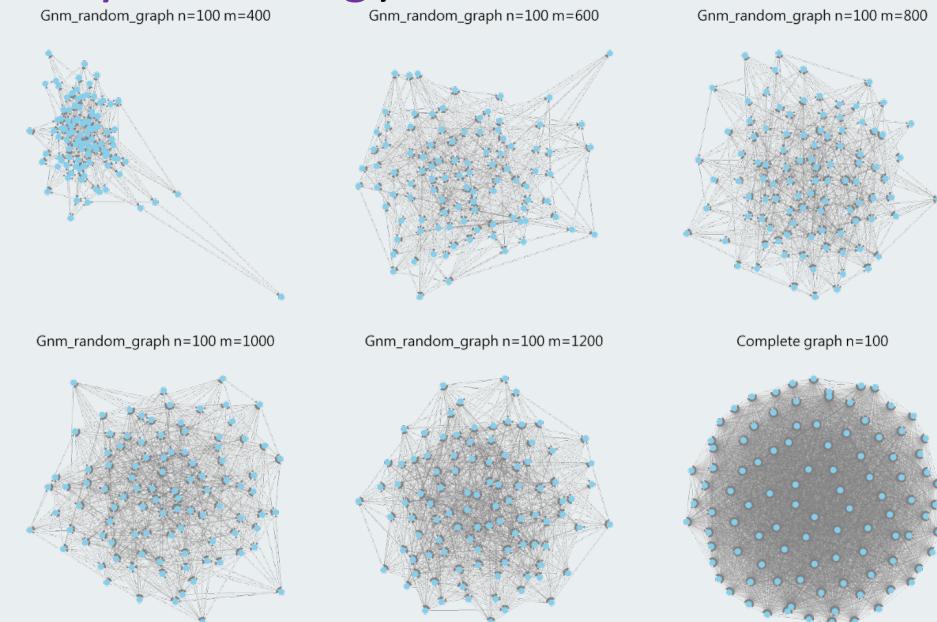
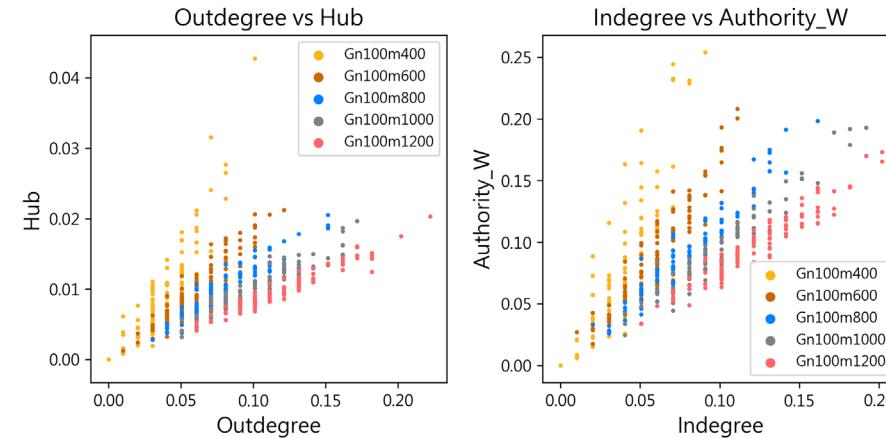
[2] Chun-Hsiang Chan, Wei-Hsian Chi. (2023) Soka Gakkai Feeling Network. Unpublished Work.

[3] Laura Ferrari, Michele Berlingero, Francesco Calabrese, Jon Reades (2014) Improving the Accessibility of Urban Transportation Networks for People with Disabilities. *Transportation Research Part C: Emerging Technologies*. Vol 45, pp27-40.

[4] Yujie Qiang, Xuewen Tao, Xiaoqing Gou, Zhihui Lang, Hui Liu (2022) Towards a Bibliometric Mapping of Network Public Opinion Studies. *Information*. Vol. 13(1), 17; <https://doi.org/10.3390/info13010017>.

Why do you need to take this course?

- This course will teach the fundamental concepts of network formation and quantitative characterization for network structure, network visualization, community detection, and network autoregression. (*Graph Deep Learning*)



Syllabus

Week	Date	Content
1	Feb. 19	Course Introduction
2	Feb. 26	Introduction to Complex Network
3	Mar. 4	Data Collection and Network Formation
4	Mar. 11	Ego Network
5	Mar. 18	Centrality I
6	Mar. 25	Centrality II
7	Apr. 1	Network Visualization
8	Apr. 8	Midterm Pitch
9	Apr. 15	[Online] Group

Week	Date	Content
10	Apr. 22	[Online] Network Positions
11	Apr. 29	Two-mode Networks
12	May 6	Network Autoregression
13	May 13	Quadratic Assignment Procedure
14	May 20	Graph ML Intro.
15	May 27	Final Project Presentation
16	Jun. 3	(Final Exams)



Grading policy

- All you have to do is study hard and feel free to ask questions when you do not understand.
- I believe that if you fulfill all the required items, you will pass this course.
- Do not worry about the grade! The most important thing is what you learn from this course.

Assignments 30 %

Midterm Report 20 %

Attendances 10 %

Final Report 40 %



Requirements

- In this course, we will **NOT** teach you how to design a program with Python.
- So, if you are **NOT** familiar with Python, please put **MORE EFFORT** into learning Python programming by any tutorials.
- Basically, ... ***DON'T WORRY*** ...



Textbooks

- Erwin Kreyszig (2018) Advance Engineering Mathematics 10e. Wiley.
ISBN: 978-1-119-93416-5.
- Dmitry Zinoviev (2018) Complex Network Analysis in Python.
Pragmatic Bookshelf. ISBN: 9781680502695.
- Krishna Raj P. M., Ankith Mohan, K. G. Srinivasa (2018) Practical Social Network Analysis in Python. Springer.

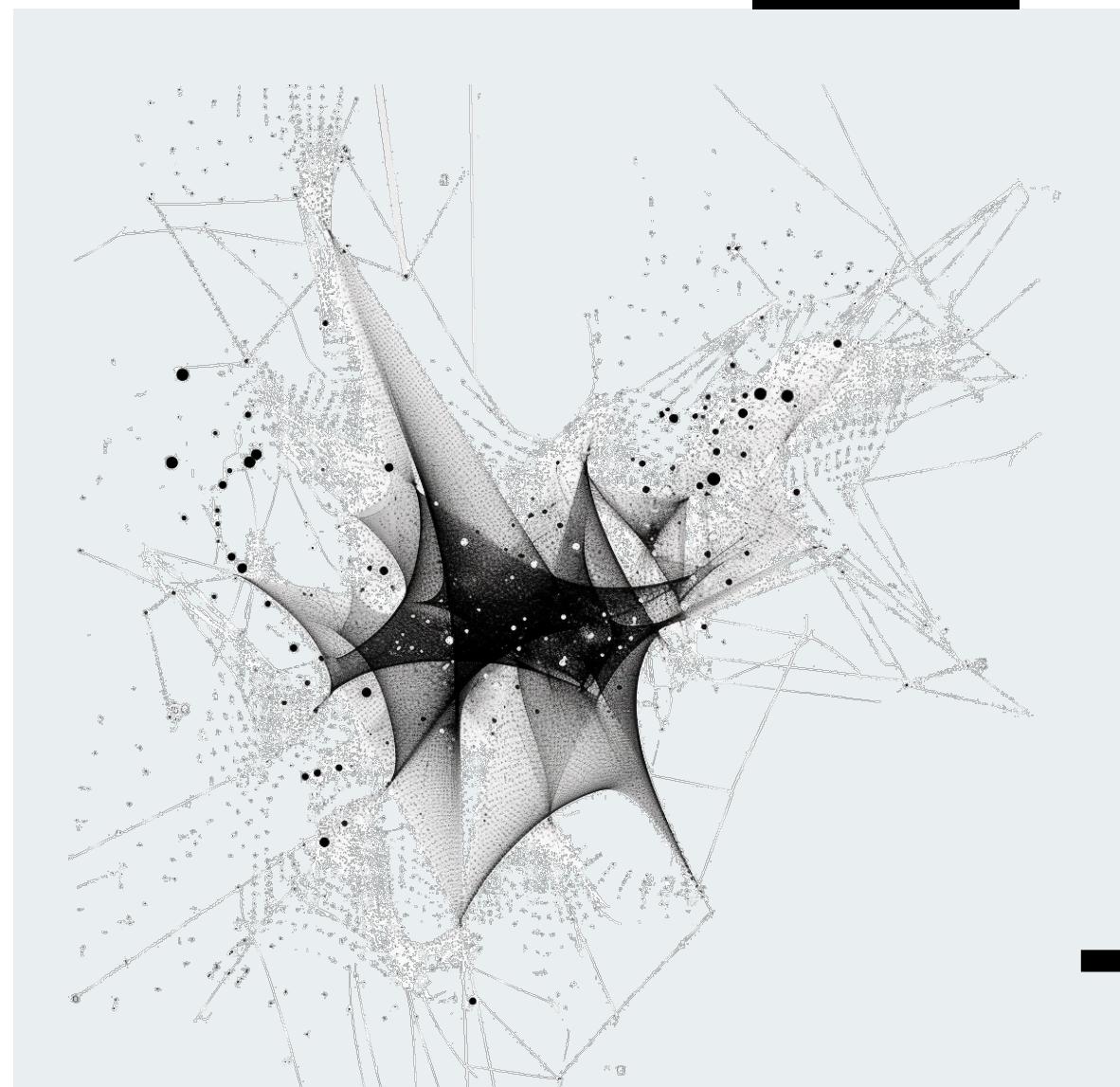


Assignments

- Small Mathematical Problems
- Coding Practice
- Paper Reading

$$C_i = \frac{\lambda_G(v)}{\tau_G(v)},$$

$$\tau_G(v) = C(k_i, 2) = \frac{1}{2} k_i(k_i - 1)$$



Social Network Analysis

The End

Thank you for your attention!



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